

## NUCLEAR TERRORISM AND THE ESCALATION OF INTERNATIONAL CONFLICT

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The dangers posed by the proliferation of nuclear weapons among nations of the world to international security have long been recognized by analysts of political and military affairs.<sup>1</sup> Problems for international security posed by terrorist acts have also been examined.<sup>2</sup> Recent analysis, however, has focused on the nexus of these two different threats to international security—terrorist acquisition and possible use of nuclear explosive devices, radiological weapons, or attacks on various nuclear facilities and installations.<sup>3</sup> Few studies have examined the problems arising from incidents of nuclear terrorism, choosing instead to focus solely on the feasibility or probability of nuclear terrorism. These studies have resulted in significant improvements in efforts to

protect physically nuclear materials and nuclear weapons stockpiles, particularly those under U.S. jurisdiction.<sup>4</sup> However, the problem of limiting the escalation of conflict arising from terrorist acts in which nuclear explosive devices, radiological weapons, or attacks on nuclear facilities are employed remains to be considered. This paper addresses this problem. Hopefully it will initiate scholarly discussion and analysis.

**Defining Nuclear Terrorism.** Nuclear terrorism can be defined as the unauthorized use or attempted use of nuclear explosive devices, use or attempted use of nuclear materials, or attacks or attempted attacks on nuclear facilities and installations for extortionate purposes. The victim of

nuclear terrorism may be an individual, a group of individuals, an organization, or a government. The primary actor on whom the burden of response to nuclear terrorism will fall, however, is the government of a nation on whose territory nuclear terrorist acts are committed. Governments rather than individuals, groups of individuals, or organizations will assume primary responsibility for response because of the scope and magnitude of the effects nuclear terrorist acts may have on individuals, property, and the entire fabric of society.

Four distinct types of nuclear terrorist acts can be considered: overt threat to use nuclear explosive devices or radiological weapons, or an overt threat to attack a nuclear facility; use of nuclear explosive devices; use of radiological weapons; and attacks on nuclear facilities housing nuclear weapons, peaceful nuclear explosive devices, nuclear fuel cycle processes and materials, or nuclear weapons fabrication processes and materials.

How likely is nuclear terrorism? The answer to this question depends on several factors; however, three factors seem particularly significant. The first factor is the amount of expertise needed to fabricate or otherwise acquire nuclear explosive devices or radiological weapons or to attack various nuclear facilities. The amount of expertise needed to fabricate a nuclear explosive device varies in inverse proportion to the fissionability of material available. No expertise is required to assemble a nuclear explosive device if it can be stolen intact from the arsenal of a nuclear weapon state or a state possessing "peaceful nuclear explosive devices." Considerable expertise is necessary to fabricate a nuclear explosive device from uranium highly enriched in isotope 235 or 233 or from plutonium. Vast amounts of expertise as well as considerable capital equipment and other economic resources are required

to fabricate natural uranium isotope 238 into a nuclear explosive device.

It is important to bear in mind that a terrorist trying to construct a nuclear explosive device does not operate under the same rigorous performance constraints that bound the efforts of a military weapon designer. After all, "a clandestine nuclear bomb maker may care little whether his bombs are heavy, inefficient, and unpredictable. They may serve his purposes so long as they are transportable by automobile and are very likely to explode with a yield equivalent to at least 100 tons of chemical explosive."<sup>5</sup> While the amount of expertise needed to construct a bomb is perhaps no greater than that derived from college physics, chemistry, and perhaps engineering, the amount of expertise needed to construct a simple device for dispersing radioactive material is even less. Any container capable of dispensing liquid radioactive waste under pressure would be sufficient; pouring liquid or particulate radioactive materials into air-conditioning systems of large buildings or into urban water supplies might also represent highly effective methods of dispersing some radioactive materials.

The amount of expertise needed to attack a nuclear facility depends, in very large measure, on the kind of facility to be attacked. Some facilities such as nuclear weapons fabrication plants are heavily guarded and would require a sizable force of terrorists for there to be much chance of a successful attack. Other installations such as nuclear fuel fabrication plants, nuclear power reactors, spent nuclear fuel reprocessing centers, critical assemblies used in research, and various installations using radioisotopes in research, industrial processes, or medical treatments might require very little military-type expertise to be successfully overcome.

The second factor bearing on the likelihood of nuclear terrorism is the accessibility of nuclear materials to

potential nuclear terrorists. There are many radioactive substances that might be suitable for use as radiological weapons. These are materials that could be acquired from scientific supply houses, industrial materials wholesalers, and other types of industries catering to the research, teaching, and quality control market. Most, if not all of these substances, however, are not suitable for use in nuclear explosive devices.

There are relatively few materials that can be taken off the shelf of a chemical supply house or a nuclear facility and fabricated into a nuclear explosive device. Most of these materials are not widely distributed or used outside the nuclear power or nuclear explosives fabrication industries. These materials include the following: uranium enriched to 90 percent in isotope 235 or 233; plutonium; plutonium nitrate in solution; enriched uranium isotope 235 hexafluoride; high-temperature, gas-cooled reactor graphite-coated fuel particles; fuel elements for light water reactors using plutonium; plutonium oxide and depleted uranium oxide pellets used as fuel for liquid metal fast breeder reactors, and critical assemblies used in physics research on college campuses and in industry.<sup>6</sup> Most, if not all, of these materials are regulated by international safeguards when transferred from a nuclear weapon state to other states; the U.S. Government also imposes standards of physical security on installations handling these materials as well as other materials that could, with additional processing, be fabricated into nuclear explosive devices.<sup>7</sup> Other nations employ similar systems of physical and accounting safeguards to minimize the likelihood of theft or misuse of these nuclear materials. Limiting access to these materials by various methods significantly reduces the likelihood that terrorists will be able to acquire materials which could be fabricated into a nuclear explosive device. Unfortunately, access to

materials that could be used in radiological weapons is often not well regulated by national or international safeguards.<sup>8</sup>

The third factor that figures prominently in calculating the likelihood of nuclear terrorism is the motivation of individuals and groups employing terrorist tactics to achieve their political and/or economic objectives. While our definition of terrorism has excluded psychotic or neurotic behavior, deranged individuals might also employ nuclear explosive devices, radiological weapons, or attack various nuclear facilities as a result of their illnesses. One analyst has prepared a list of potential terrorists and the motivations underlying their behaviors:

#### Possible Malefactors

1. Foreign governments and their agents, acting under orders.
2. Sub-units of foreign governments and their agents or military forces acting with or without official sanction.
3. Individuals or groups engaged in domestic subversive activity: extremists, terrorists, nihilists.
4. Criminals—highly organized, loosely associated, or individual.
5. Psychopaths, severe neurotics, and psychotics, harboring sadistic homicidal, or suicidal motives.
6. Mercenaries in the pay of others, or who need the money to pay off debts, support a heroin addiction, etc.
7. Disgruntled employees seeking to sabotage an installation for revenge, or out of casual vandalism.

#### Motives for Nuclear Malfeasance

1. International enmity or rivalry.

2. Sectional or factional enmity, such as civil war, terrorism.

3. Desire to create panic or interrupt electrical power, either for its own sake or secondary to some other design, such as looting under cover of darkness, etc.

4. Desire to establish credibility of later threats of repetition, demands for blackmail payments, etc.

5. Desire to obtain special nuclear materials for bombs.

6. Desire to obtain radioactive waste materials for terror, homicide, blackmail, or resale. Motives 6 and 7 may also subsume the desire to control such materials in order to secure immunity from persecution or prosecution for the thieves or for others as stipulated in threats to the authorities.

7. Sadistic motivation—merely to cause suffering. This might take the form of a specific grudge against particular persons likely to be killed or injured in a nuclear incident, such as employer, spouse, rival, etc.

8. Suicidal/homicidal motivation—to die spectacularly, take other lives at the same time.

9. Publicity motivation to get one's name in the papers, or to publicize some specific cause (a frequent motive for aircraft hijacking and terrorism).

10. Psychotic motivation. This can take various forms, depending on the nature of the delusional system involved.<sup>9</sup>

One might add to this list the theft or possible use of materials by accident of opportunity. Clearly, recent experience in the Middle East, in Northern Ireland, in Japan, in the United States, in Western Europe, and in Latin America illustrates the willingness of individuals to use extreme, extortionate violence to

attain their political and/or economic objectives.

In calculating the likelihood of nuclear terrorism, at least these three factors must be simultaneously evaluated. Merely because an individual has expertise in the design of nuclear explosive devices and may have access to materials that could be used to fabricate such a device, he may not be motivated to become a nuclear terrorist. Indeed, I suspect that a potential nuclear terrorist first would consider using nuclear materials or attacking nuclear facilities, then he would acquire the necessary expertise to fabricate a nuclear explosive device, construct a radiological weapon, or attack a nuclear facility. Finally, he would seek out the appropriate materials to carry out such plans.

Reasonable people may reach different conclusions about the net threat of nuclear terrorism. Some may conclude that the threat is not very great; others may conclude nuclear terrorism is imminent. My own view is that nuclear terrorism is probably inevitable. We have already witnessed several terrorist or terrorist related incidents involving nuclear materials.

At least one attempt has been made to extort money from government officials by an individual threatening to destroy a city with a homemade, thermonuclear bomb. The attempt was thwarted by good police work, not because the design of the bomb accompanying extortion notes was considered defective by government officials.<sup>10</sup> Unknown individuals disseminated radioactive materials normally used in medicine aboard an Austrian train in April 1974, causing much concern if not substantial property damage and casualties among railroad passengers.<sup>11</sup> Concern over possible theft of nuclear weapons has mounted in the United States over the past few years as various shortcomings in the physical security of U.S. nuclear weapons have been revealed. In 1974, reports reached the

press that a Nike-Hercules anti-aircraft installation outside Baltimore had been broken into in an apparent attempt to steal nuclear weapons thought to be stored at that installation for use in air defense.<sup>12</sup> During the period, 1973-1975, members of Congress investigated the security of U.S. nuclear weapons stored overseas. Senator Symington, commenting on U.S. nuclear weapons stored in Korea, reported that we "were not being as careful with our nuclear stockpile in the Far East as we are in Europe."<sup>13</sup> The European situation was termed "critical" by Senators Pastore and Baker in discussions with Defense Secretary Elliot Richardson upon their return from an inspection of the U.S. European nuclear weapons stockpile.<sup>14</sup> While many of these deficiencies were corrected in the eyes of critical Senators,<sup>15</sup> the U.S. Government intends to continue its efforts to upgrade the security of nuclear weapons stored at home and abroad to the tune of \$230 million over the period, July 1975 through September 1977.<sup>16</sup>

In addition to these problems, there have been several known threats against nuclear facilities such as nuclear reactors or uranium enrichment plants.<sup>17</sup> The crash of a B-52 bomber some 20 miles from a nuclear power reactor plant in South Carolina<sup>18</sup> raised the specter of a terrorist flying a "kamikaze" mission into a nuclear facility. David Krieger quotes then Atomic Energy Commission Chairman Dr. James Schlesinger, appearing on a radio question-and-answer program, discussing this subject with typical bluntness and candor:

If one intends to crash a plane into a facility and one is able to persuade the pilot that that is the best way to go, there is, I suspect, little that can be done about the problem.

The nuclear plants that we are building today are designed carefully to take the impact of, I

believe, a 200,000 pound aircraft arriving at something on the order of 150 miles per hour. It will not take the impact of a larger aircraft.<sup>19</sup>

Krieger notes that a Boeing 747 "weighs about 365,000 pounds and travels considerably faster than 150 miles per hour."<sup>20</sup> Thus, even nuclear power plants protected by very strong physical security on the ground might be vulnerable to air attack by kamikaze pilots or remotely piloted vehicles.

We have witnessed only a few incidents resulting in minimal property damage, little loss of governmental prestige, and minimal international conflict. What will happen, however, if a terrorist group succeeds in stealing nuclear materials, fabricates a bomb, and actually detonates it? Furthermore, what will happen if the terrorists steal materials from one country, fabricate a bomb in bases on the territory of a second country, and detonate the bomb on the territory of yet a third? What will the government victimized by a nuclear terrorist act do? How will other nations respond to the nuclear terrorist incident and the countermeasures taken by the victim government? We turn now to a consideration of the physical effects and political consequences of nuclear terrorism.

**The Effects of Nuclear Terrorism.** There are several physical effects that would result from the detonation of a nuclear explosive device, the dispersal of radioactive material, or the attack on various nuclear installations in which radioactive material was released. Use of nuclear explosive devices by terrorists would result in the same types of damage caused by military use of nuclear weapons. Dispersal of radioactive material might cause many of the same problems associated with the effects of radioactive fallout from atmospheric nuclear weapons tests or the long-term consequences of the use of nuclear

weapons. Attacks on various nuclear installations resulting in the release of radioactive materials might cause a broad range of physical effects ranging in severity from little more than small spills of radioactive material following accidents involving U.S. nuclear weapons in the midair collision of a B-52 bomber and a tanker over Spain<sup>21</sup> to the kinds of damage envisioned as the result of a nuclear reactor core meltdown with simultaneous failure of the emergency core cooling system.<sup>22</sup>

Terrorist detonation of a nuclear explosive device would cause damage and casualties as a result of four specific forces: blast, thermal radiation, prompt nuclear radiation, and long-term nuclear radiation. Additionally, disruption of communications and malfunctions of electronic equipment might occur as the result of electromagnetic pulse. The severity of these effects would depend on a number of factors, including the following: yield of the explosion; types of materials used in the fabrication of the device, height of the device above ground at the time of detonation; prevailing wind and weather conditions at the time of detonation and for a period of hours thereafter; relative hardness of the target area; and the amount of relief, rescue, and medical aid immediately available to survivors of blast and thermal effects.<sup>23</sup>

The effects of terrorist use of radiological weapons are far more difficult to predict. Such effects would depend in very large measure on the kinds of radioactive materials dispersed, the pattern of dispersal, and the length of time individuals are exposed to radioactive materials. Use of radiological weapons, in addition to possibly causing casualties, would result in the contamination of a wide range of physical resources including land, water supplies, buildings, and capital equipment. These effects would also occur as a consequence of radioactive fallout generated by the detonation of a nuclear explosive

device. Dispersal of radioactive material might not cause casualties; however, it would necessitate expensive, time-consuming, disruptive decontamination efforts.<sup>24</sup>

Attacks on nuclear facilities intended to cause the release of radioactive material into the atmosphere are perhaps the most difficult forms of nuclear terrorism to evaluate in terms of physical effects. The nature of the work being carried out at the installation to be attacked, the kind of materials and processes used in the facility, the difficulty in bypassing redundant safety features built into the facility, the ability of the facility effectively to contain released radiation within its physical structures or on the site, and the degree of physical protection against direct attack are all important variables that affect the physical effects of terrorist attacks on nuclear facilities. While overcoming these obstacles to the release of radioactive material into the biosphere during a terrorist act is a major task, Theodore B. Taylor reminds us that criminals have been eminently successful in attacking heavily fortified buildings and vaults in recent years:

In the last fifteen years more than two dozen major thefts from modern alarmed vaults wired directly to a protective agency have been reported. Alarm systems connected only to the door of the secured place have been circumvented, and comprehensive alarm systems have been successfully disconnected. Burglars have used diamond-tipped steel drills, acetylene torches, twenty-millimeter antitank guns, thermic lances, explosives, and other highly specialized equipment to penetrate cement-filled doors, steel-reinforced concrete vault walls, steel vaults, and steel vault doors as much as two feet thick.<sup>25</sup>

Taylor argues, in effect, that nuclear facilities are vulnerable to attack by highly organized, well-equipped terrorists just as are Brinks armored trucks, large bank vaults, and other "secure" installations.

A broad set of qualifications must be introduced in trying to estimate the effects of an attack on a nuclear facility that results in the release of nuclear or radioactive materials into the biosphere. The location of the facility in relation to large concentrations of civilian or military personnel is obviously important in estimating casualties. The weather at the time of the incident and for a period of hours thereafter is also an important factor. The extent to which the site of such an attack was cut off from outside assistance would also affect the number and extent of casualties, as would the reaction of individuals displaced by preventative or rescue and relief efforts. Mass panic arising from fear, hasty and poorly planned evacuation of areas, unconfirmed rumors, et cetera, could claim large numbers of lives through accidents, coronaries, and the withdrawal of medical services by overworked, frightened, and perhaps injured medical personnel.<sup>26</sup>

The ability of terrorists to acquire and use nuclear explosive devices or radiological weapons, or to attack successfully nuclear facilities causing the release of radioactive material into the biosphere may lead to wild speculation about the number of casualties in various scenarios. While numbers are somewhat hard to pin down, there are many factors which influence the severity of casualties resulting from blast, thermal radiation, prompt nuclear radiation, and long-term radiation. The types of materials used, weather, distribution of radioactive materials, length of exposure to radiation sources, and the reaction of the victims of nuclear terrorist acts all bear on the severity of the physical effects of nuclear terrorism. The physical effects of nuclear terrorism, in turn,

may substantially affect the political consequences of nuclear terrorism. We turn now to a consideration of this aspect of the problems posed by nuclear terrorism.

**The Political Consequences of Nuclear Terrorism.** There is a variety of political consequences arising from incidents of nuclear terrorism that affect governments of many states in addition to the government of the state victimized by nuclear terrorist acts. While the latter is necessarily faced with the most difficult choices in responding to and coping with the effects of nuclear terrorism, a number of factors very quickly brings other governments into contact with the political fallout of a nuclear terrorist act. While the broad range of specific acts of nuclear terrorism and the incalculable number of potential targets make it impossible to detail all the possible consequences of nuclear terrorism, analysts should try to understand those types of consequences or actions that would be particularly important in controlling the escalation of international conflict following an incident of nuclear terrorism.

There are at least four major types of consequences or actions that merit attention. First, we should consider how the government of a victimized state will react to the nuclear terrorist act. Second, we should examine how other states will perceive the victim's actions and reactions to nuclear terrorism. Third, we must consider the actions of the government of the state ravished by nuclear terrorism toward other states. Finally, we should contemplate the broad systemic consequences of nuclear terrorism for international relations generally.

The government of a state which is attacked by nuclear terrorists in any of the four broad types outlined above is immediately confronted with several problems. It must determine if a threat to use nuclear explosive devices or

radiological weapons or to attack nuclear facilities is credible, or it must verify the actual occurrence of a terrorist act. Second, it must identify the most probable perpetrators of nuclear terrorism independently of various claims of responsibility. Third, it must cope with a variety of domestic problems generated by nuclear terrorism. Casualties must be treated; the homeless resettled; property, buildings, capital equipment, and farmland must be decontaminated; and the faith of citizens in their government's ability to protect them must be restored.

The actions taken by the government of a state ravished by nuclear terrorism directed solely within its own territory to cope with nuclear terrorism may nonetheless precipitate major international crises leading to international conflict. A number of actions taken in the absence of confirmation that nuclear terrorist acts have occurred are ambiguous; given the presence of latent or manifest conflict between two nations or two sets of nations, these actions might be interpreted as preparations for war. For example, evacuation of cities, censorship of news, drastic changes in patterns or modes of internal communication, suspension of regular commerce, declarations of martial law or changes in civil police procedure, limited or general military mobilization, or redeployment of military forces-in-being might all be reasonable steps for a government trying to cope with nuclear terrorist acts to take. Each of these measures or a combination of such measures might also be perceived as preliminary preparations for war.<sup>27</sup> This interpretation seems especially likely in those cases where previous real or alleged incidents of terrorism have precipitated reprisals by the victimized state against its neighboring states or other states thought to have been responsible for the initial terrorist act.<sup>28</sup>

The government of a state trying to

cope with nuclear terrorism might also undertake a variety of nonmilitary and military measures against one or more other states. Likely targets of these actions include states thought to have supplied nuclear materials to terrorist groups; states assumed to have harbored nuclear terrorist groups before and/or after commission of terrorist acts; states thought to have supplied nuclear terrorists with nonnuclear supplies, technical resources, expertise, or money. The government of the victim state might turn to other states for the extradition of any individual alleged to have been involved in the nuclear terrorist incident. States might also seek international cooperation and assistance in identifying the sources of nuclear materials used in the fabrication of nuclear explosive devices or radiological weapons. Claims for indemnification of individuals, organizations, and governments suffering personal injury and property loss as the result of nuclear terrorism might be filed against various states, including nuclear materials supplying states as well as nuclear materials recipient states.

The use of military force in response to nuclear terrorism by the victim state cannot be overlooked. Military force could be deployed against the same wide variety of states noted above. The range of military actions that could be undertaken could vary greatly from minimum efforts to close the border between the victim state and its neighbors to more drastic actions. These actions might include some or all of the following: interdiction of terrorist infiltration routes; attacks on terrorist base camps; embargo or blockade of states aiding terrorists or permitting terrorists to operate from their territories; attacks on the civilian population of other states roughly equaling the destruction caused by a nuclear terrorist act; destruction of other states' nuclear facilities; or even a full-scale invasion and occupation of other states in



reprisal for nuclear terrorism.

It is clear that acts undertaken by the victim state toward other states would have profound effects on international order. The military actions described above would be sufficient to unleash a major war, depending on the states directly involved and the strength of their respective alliance systems. Incidents of nuclear terrorism involving materials nominally under international safeguards would automatically raise very serious questions about the reliability of International Atomic Energy Agency (IAEA) safeguards on nuclear materials. IAEA inspection of national nuclear materials accounts, the primary safeguard against diversion of nuclear materials, that fail to detect the diversion of nuclear materials subsequently thought to have been used in the commission of a nuclear terrorist act may raise very grave questions about the entire safeguards system. Such questions once raised would be very hard to quiet, hence weakening the IAEA's ability to perform its critical function of verifying the Nuclear Nonproliferation Treaty.<sup>29</sup>

Nuclear terrorism may also raise a number of problems relating to the obligations assumed by the nuclear weapon states in their adherence to the Nuclear Nonproliferation Treaty—Security Council Resolution 255, (19 June 1968).<sup>30</sup> The nuclear weapon states might find themselves in a position of direct confrontation with one another because of demands on the part of the government of the state attacked by nuclear terrorists for assistance. Furthermore, use of nuclear terrorism by a group claiming the status of a state, i.e., a liberation movement, might cause major political problems in relations among the nuclear weapon states, as well as between the nuclear weapon states and nonnuclear weapon states.

Successful nuclear terrorism might also give rise to more general security problems without regard to actions undertaken by the victim state. All

states would become concerned about nuclear terrorism and might undertake actions that could easily be misinterpreted by other, potential adversaries. Successful nuclear terrorism in one part of the world might be an invitation to terrorists in other parts of the world to use nuclear explosive devices, radiological weapons, or attacks on nuclear facilities as an effective, spectacular means of achieving political and economic objectives. Government leaders might conceivably be faced with a new set of dominoes—nuclear facilities, sources of radioactive materials, or sources of fissionable materials.

In surveying the political consequences of nuclear terrorism, it becomes clear that nuclear terrorism creates problems which, in turn, may be more destructive over the long term than the act of nuclear terrorism itself. Initiation of hostilities between two or more states as the result of a catalytic nuclear terrorist act ought to be an outcome over which great efforts would be expended in an effort to avoid it. Unfortunately, little attention has been paid to the problem of limiting the escalation of conflict arising from nuclear terrorism. We now turn to some possible steps that might be taken unilaterally, bilaterally, or multilaterally by nations of the world to avoid the "worst case" outcome of a nuclear terrorism incident.

**Limiting the Escalation of International Conflict Arising from Nuclear Terrorism.** Nuclear terrorism can be analyzed in traditional arms control terms with considerable improvement in understanding of the problems to be solved. The objective in developing mechanisms to cope with nuclear terrorism is to reduce the likelihood of war and, failing that, to minimize the effects of war should it occur.

Nuclear terrorism is an inherently ambiguous event. Thus, there is a need for all parties—states, international organizations, and terrorists—to verify

many different aspects of terrorism. In addition to verification, there is a need to develop a set of incentives and penalties, as well as a means of enforcing these incentives and penalties to discourage the escalation of international conflict as the result of a nuclear terrorist act. There is also a need to detect attempts to employ nuclear terrorism so that appropriate, non-escalatory countermeasures can be taken. Let us examine each of these problems momentarily.

The state attacked by nuclear terrorists has several distinct verification problems. First, it needs to determine whether or not it is under attack by terrorists, by unauthorized action by regular military forces of another state, or by a clandestine military operation mounted by another state. The government of the state under nuclear terrorist assault must also verify the use of nuclear explosive devices, radiological weapons, or the successful attack on nuclear facilities so that it may undertake appropriate decontamination actions as well as mobilize necessary medical and relief personnel.

Other states, too, have a vested interest in confirming the identity of nuclear terrorists. Some states may find themselves committed to military action by treaty or executive agreement unless it can be established that their ally, the victim of a nuclear terrorist act, is not under an authorized military assault from another state. States with nuclear weapons or peaceful nuclear explosive devices may also be very concerned about the identity of nuclear terrorists as well as the source of nuclear materials because of their concern about possible breakdowns in command and control over their own nuclear weapons.

Potential adversaries of the victim of nuclear terrorism require verification of a number of acts. First, they too need to verify that nuclear terrorist acts are committed by terrorists and not agents provocateur on the one hand, or that

alleged nuclear terrorist acts are not simply a pretext for the victim to initiate hostilities against one or more potential adversaries on the other. Second, potential adversaries of the victim state need confirmation of nuclear terrorism incidents to interpret what are otherwise ambiguous events in the victim country. Other countries neither aligned with the victim or potential adversaries require verification of nuclear terrorist acts so that they may be able to assist in the management of crises by refusing havens to alleged nuclear terrorists, providing rescue and relief supplies and personnel, and offering their good offices to mediate disputes arising between the government of the target state and other states it feels are responsible for nuclear terrorist acts.

In addition to coping with the problems of ambiguity inherent in real or alleged acts of nuclear terrorism, in the domestic responses to nuclear terrorism, and in the international responses to nuclear terrorism, attention should be paid to the development of mechanisms that militate against both domestic and international escalation of conflict arising from incidents of nuclear terrorism. One set of possible remedies addresses some of the underlying motivations for escalation on the part of the victim state. Another set of possible remedies looks at the problem of limiting the scope and magnitude of escalation in the event of nuclear terrorism.

There are a number of factors that would tend to encourage the government of a state ravished by nuclear terrorist acts to lash out at real or imagined enemies in an effort to cope with the problems raised by nuclear terrorism. One of the incentives to lashing out would be to apprehend and bring to justice those individuals directly responsible for nuclear terrorist acts. An arrangement providing for the prosecution or extradition for

prosecution of individuals alleged to have participated in nuclear terrorism analogous to the Convention for the Suppression of the Unlawful Seizure of Aircraft<sup>31</sup> may be a useful measure in the management of crises arising from nuclear terrorism. While this kind of guarantee of prosecution may not deter terrorists, it may discourage states from kidnapping alleged nuclear terrorists on the territory of other states and forcibly returning these individuals to the victim state for prosecution.\* Such actions might cause very serious problems for the relations among the states directly involved in the "forcible extradition" of alleged nuclear terrorists.

Agreement in some form might also be reached to provide for the compensation of individuals suffering injury or property loss as the result of nuclear terrorism. Such an agreement might contain a flat limitation of liability comparable to the Price-Anderson insurance arrangement for the U.S. nuclear industry;<sup>32</sup> it might have provisions for sharing of costs among all nuclear materials supplying and receiving nations. If some mechanism could be developed to minimize the financial losses incurred by governments, private citizens, and various economic entities as the result of nuclear terrorism, the government of the state injured by nuclear terrorism might be better able to resist internal public opinion and bureaucratic pressures to resort to the use of military force to redress the grievances of its citizens against other states.

Some form of agreement to prosecute or extradite individuals accused of participating in nuclear terrorism and another agreement to provide compensation to the victims of nuclear terrorism may take some escalatory pressures out of nuclear terrorism from the perspective of the victim. Neither agreement, however, will do much to aid in the verification or detection problems alluded to earlier. Here, there are some recent developments worth noting that augur well for improved international capability to detect nuclear terrorism.

Earlier in this paper, it was observed that limiting access to nuclear materials seemed to be the easiest, surest way to reduce the likelihood of nuclear terrorist incidents. An agreement was concluded among the seven major nuclear materials supplying nations—the United States, the Soviet Union, the United Kingdom, Canada, France, and the Federal Republic of Germany—imposing a variety of physical safeguards on nuclear materials supplied to other states under agreements for cooperation safeguarded by the IAEA. While the exact content of the agreement has not been made public, newspaper accounts suggest that the kind of physical protection demanded would be sufficient to improve greatly the likelihood of detecting attempts to steal nuclear materials in transit from supplier to recipient as well as from stockpiles of materials already in the hands of the recipient nation.<sup>34</sup>

National intelligence networks relying on both national technical means of verification and a variety of other human assets and analytical techniques may be able to aid in the verification of attempted or successful acts of nuclear terrorism.<sup>35</sup> The critical problem is the distribution of intelligence data from one country to another in a manner that does not compromise intelligence sources and methods, but nonetheless permits all concerned to verify nuclear terrorist acts, domestic responses to

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\*The kidnapping and forcible extradition of Adolf Eichmann from Argentina to Israel in May 1960, resulted in a considerable increase in tensions between those two states until August 1960, when the two governments agreed to drop the matter of forcible extradition. The issue did arise during Eichmann's trial when the defense challenged the competence of the Israeli court to try Eichmann because of his extralegal extradition to Israel.<sup>33</sup>

such acts, the possible attempt at nuclear terrorism, and other related actions.<sup>36</sup>

The use by the International Civil Aviation Organization (ICAO) of intelligence data on possible airplane hijackers provided by member nations may be a useful model on which to base a similar scheme of intelligence data sharing. Apparently, when a national intelligence organization detects a possible airplane hijacking attempt, it alerts the ICAO. The ICAO in turn distributes this information directly to all member nations. Thus, member states are alerted to the dangers of airplane hijackings without any one nation's intelligence sources and methods being unduly compromised.<sup>37</sup>

Another possible approach to the problem of verification of nuclear terrorist acts and various domestic actions taken by the victim government might be "verification by challenge" as formulated in the Biological Weapons Convention.<sup>38</sup> There is no formal on-site inspection or other verification of the destruction or diversion "to peaceful purposes . . . of all agents, toxins, weapons, equipment, and means of delivery . . ." of bacteriological (biological) methods of warfare.<sup>39</sup> However, there are provisions for verification in the event a nation believes another is engaging in questionable acts. Article VI provides:

(1) Any State Party to this Convention which finds that any other State Party is acting in breach of obligations deriving from the provisions of the Convention may lodge a complaint with the Security Council of the United Nations. Such a complaint should include all possible evidence confirming its validity, as well as a request for its consideration by the Security Council.

(2) Each State Party to this Convention undertakes to

cooperate in carrying out any investigation which the Security Council may initiate in accordance with the provisions of the Charter of the United Nations, on the basis of the complaint received by the Council. The Security Council shall inform the States Parties to the Convention of the results of the investigation.<sup>40</sup>

Verification by challenge would be particularly useful in better understanding the actions of the government of the state trying to cope with the aftermath of nuclear terrorism. Other states would already have some information based on diplomatic reports; verification of nuclear terrorism by challenging specific domestic responses would be beneficial in clarifying ambiguous acts without necessarily forcing potential adversaries to take actions which the victim state would regard as hostile.

Clearly, verification of nuclear terrorism could not be handled exactly the same way as verification of biological weapons manufacture or stockpiling. There would be many objections to the use of the U.N. Security Council as the primary investigating organ. Some kind of *ad hoc* arrangement drawn from governments allied with the state victimized by nuclear terrorism, the victim state's potential adversaries, and states nominally "nonaligned" in the context of the possible dispute with technical support by the International Atomic Energy Agency's office of the Inspector General might be a more appropriate verifying force. However, if the burden for verifying incidents of nuclear terrorism can be removed from the shoulders of the victim government and its potential adversaries, the chances of managing crises successfully are probably enhanced.

There are a number of other areas that might lead to conflict that will eventually have to be addressed. Time and space permit only a cursory

description of the problems yet to be addressed.

First, how are nuclear materials recovered from thefts, unsuccessful attempts at nuclear terrorism, et cetera, to be handled? Who shall pay recovery costs? Who shall insure that these recovered materials are adequately accounted and safeguarded so that they do not become the source of second or third order nuclear terrorist weapons?

Second, how shall existing safeguards be enforced? The present IAEA safeguards system merely requires that evidence of safeguard violations be presented to the Board of Governors—22 national representatives—who may act as they deem fit. Might the world be somewhat better off if a clear schedule of penalties for violation of international safeguards be established?

Third, what is the future role of the IAEA to be in any scheme of nuclear materials safeguarding and the coping with problems of nuclear terrorism? The IAEA has become more and more reluctant to take a vigorous leading role in developing physical security standards, procedures, and technology, alleging it lacks the budget and manpower necessary to accomplish these tasks. What changes, if any, in the Statute of the International Atomic Energy Agency might be in order so that it could be a more vibrant force in helping nations cope with the aftermath of nuclear terrorist acts?

Finally, what additional steps should be taken to enlarge the scope of national and international safeguards on nuclear materials? Some might argue that a large number of materials that could be used in a variety of terrorist weapons are presently beyond the scope of national or international safeguards. Given the magnitude of the risks these materials pose to international order, might this be the time to develop safeguards on radioactive elements used in industrial research, nuclear medicine, college teaching, and other

places that might be diverted to terrorist use?

These questions lead us directly to the need for an agenda of actions that can be taken over the next few years.

**An Agenda for Action.** The problem of nuclear terrorism will go away only when the more general problem of terrorism has been solved. Thus, it is necessary to consider a number of unilateral, bilateral, and multilateral steps that can be taken to minimize the likelihood of escalation of conflict arising from incidents of nuclear terrorism.

Clearly, one of the most important and perhaps most easily accomplished tasks is to restrict vastly the worldwide supply of materials from which a fission nuclear explosive device could be fashioned until such time as stringent physical security standards are developed, put in place, and enforced by suppliers of nuclear materials. The January 1976 agreement referred to above is clearly a step in the right direction.

Second, I believe there is a need for a unilateral declaration on the part of the United States on the seriousness of nuclear terrorism. Such a statement should, in my view, include a call for a policy of "no safe havens" for nuclear terrorists, preferably to be codified in an international treaty.

Third, I believe there needs to be a concerted effort to initiate international discussions on ways to minimize the escalation of conflict arising from nuclear terrorism. While the conclusion of additional agreements providing worldwide communications modeled after the United States-Soviet "Hot Line Agreement" would be useful, I think it is very important that we not lose our perspective on technology. Nuclear technology has a habit of failing; it can be made to fail. I believe we need to look beyond technological "fixes" to the problem of nuclear terrorism and deal with the "people" problem terrorism implies.

At the same time, we should be alert to the dangers some remedies to the problem of nuclear terrorism may pose to civil liberties, freedom of information exchange, and freedom of movement of peoples across international frontiers. A

balancing of the rights and interests of many diverse groups must take place; hopefully it will take place before we must cope with incidents of nuclear terrorism that result in severe escalation of international conflict.

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## NOTES

1. For some early public discussion of the dangers of nuclear proliferation, see "The Baruch Plan: Statement by the United States Representative [Baruch] to the United Nations Atomic Energy Commission, June 14, 1946," in U.S. Department of State, *Documents on Disarmament 1945-1959* (Washington, D.C.: U.S. Govt. Print. Off., 1960), vol. I, pp. 7-16. For analyses of the dangers of nuclear proliferation presented during the 1950's and 1960's, see National Planning Association, *The Nth Country Problem and Arms Control* (Washington, D.C.: National Planning Association, 1960); Leonard Beaton, *Must the Bomb Spread* (Baltimore: Penguin Books, 1966); and William B. Bader, *The United States and the Spread of Nuclear Weapons* (New York: Pegasus, 1968).

2. An excellent summary of current and past research on the problem of terrorism edited by Yonah Alexander was recently published by Praeger. The study entitled *International Terrorism: National Regional and Global Perspectives* (New York: Praeger, 1976), has an outstanding bibliography.

3. See, for example, the following studies and articles: Robert B. Leachman and Phillip Althoff, ed., *Preventing Nuclear Theft: Guidelines for Industry and Government* (New York: Praeger, 1972); Theodore B. Taylor, "Diversion by Non-Governmental Organizations," in Mason Willrich, ed., *International Safeguards and Nuclear Industry* (Baltimore: Johns Hopkins University Press, 1973), pp. 176-199; M. Willrich, "Nongovernmental Nuclear Weapon Proliferation," and D. Krieger, "Nuclear Power: A Trojan Horse for Terrorists," in B. Jasani, *Nuclear Proliferation Problems* (Cambridge: MIT Press for the Stockholm International Peace Research Institute, 1974), pp. 168-186 and pp. 187-200; Mason Willrich and Theodore B. Taylor, *Nuclear Theft: Risks and Safeguards* (Cambridge: Ballinger, 1974); and Martha Crenshaw Hutchinson, "Terrorism and the Diffusion of Nuclear Power," a Paper Prepared for Delivery to the XVII Annual Convention of the International Studies Association, Toronto, Canada, 25-29 February 1976.

4. See, for example, regulations for the handling of special nuclear materials promulgated by the Atomic Energy Commission on 5 December 1973; 15 November 1974; and regulations on the packaging of radioactive material for transport promulgated by the Atomic Energy Commission on 22 June 1974. These are reprinted in U.S. Congress, Senate Committee on Government Operations, *Peaceful Nuclear Exports and Weapons Proliferation* (Washington, D.C.: U.S. Govt. Print. Off., 1975), pp. 332-355; see also Nuclear Regulatory Commission rules and regulations governing the physical protection of nuclear plants and materials promulgated in 1975 reprinted in *ibid.*, pp. 356-361.

The U.S. Government recently extended its physical protection requirements of domestic nuclear facilities to include materials and facilities exported to other countries. See, for example, the Associated Press story, "U.S. Adopts New Requirements for Export of Nuclear Knowhow," *San Jose Mercury-News*, 21 February 1976.

5. Willrich and Taylor, p. 10.

6. *Ibid.*, p. 54.

7. United States Nuclear Regulatory Commission Rules and Regulations, Title 10, Chapter 1, Code of Federal Regulations, Parts 70, 71, and 73, reprinted in *Peaceful Nuclear Exports and Weapons Proliferation*.

8. See, for example, materials to be subjected to international safeguards described in International Atomic Energy Agency, *Safeguards and The Structure and Content of Agreements Between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons* reprinted in *ibid.*, pp. 732-788.

9. Douglas DeNike, "Nuclear Safety and Human Malice," mimeographed paper, University of Southern California School of Medicine, 1972, quoted by Krieger, pp. 195-196.

10. Timothy Ingram, "Nuclear Hijacking: Now Within the Grasp of Any Bright Lunatic," *Washington Monthly*, June 1973 reprinted in *Peaceful Nuclear Exports and Weapons Proliferation*, pp. 32-33.

11. "Austria Seeks 'Atom Guerrilla'" Reuter, *San Jose Mercury*, 23 April 1974; also Thomas O'Toole, "Fear of Nuclear Theft Stirs Experts, AEC," *Washington Post*, 25 May 1974.
12. Thomas O'Toole, "2 Break-Ins Suggest Thieves Eye A-Arms," *Washington Post*, 28 July 1974.
13. Ingram, p. 37.
14. "Security Review at Certain NATO Installations," *Congressional Record*, vol. 121, No. 68, 30 April 1975, pp. S7184-S7189, especially pp. S7185-7188.
15. *Ibid.*, p. S7184.
16. Donald Rumsfeld, *Annual Defense Department Report, FY 1977* (Washington, D.C.: U.S. Department of Defense, 1976), p. 86.
17. Ingram, p. 34.
18. United Press International, "B-52 Explodes Near A-Plant," *San Jose Mercury*, 4 September 1975.
19. James R. Schlesinger quoted from transcript of "Meet the Press," in a *Mike Gravel Newsletter*, 31 October 1973, by David Krieger, "Terrorists and Nuclear Technology," *Bulletin of the Atomic Scientists*, vol. 31, No. 6, June 1975, p. 32.
20. *Ibid.*
21. See Phil Goulding, *Confirm or Deny* (New York: Harper & Row, 1970), pp. 23-51.
22. For detailed and critical analysis of the effects of a reactor core melt-down see the following: U.S. Atomic Energy Commission, *The Safety of Nuclear Power Reactors and Related Facilities* (Washington, D.C.: U.S. Atomic Energy Commission, WASH-1250, June, 1973); U.S. Atomic Energy Commission, *Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Power Plants* (Washington, D.C.: U.S. Atomic Energy Commission, Draft WASH-1400, August 1974).

See also Joel Primack and Frank von Hippel, "Nuclear Reactor Safety," *Bulletin of the Atomic Scientists*, vol. 30, No. 8, October 1974, pp. 5-11; Norman C. Rasmussen, "The Safety Study and Its Feedback," *Bulletin of the Atomic Scientists*, vol. 31, No. 7, July 1975, pp. 25-28, and U.S. Congress, House Committee on Interior and Insular Affairs, *Oversight Hearings on Nuclear Energy—Overview of the Major Issues* (Washington, D.C.: U.S. Govt. Print. Off., 1975).

23. See the following for discussion of the effects of nuclear weapons: S. Glasston, ed., *The Effects of Nuclear Weapons, 2nd Edition*, (Washington, D.C.: U.S. Govt. Print. Off., 1962); U.S. Congress, Senate Committee on Foreign Relations, *Briefing on Counterforce Attacks* (Washington, D.C.: U.S. Govt. Print. Off., 1975) and *Analysis of Effects of Limited Nuclear Warfare* (Washington, D.C.: U.S. Govt. Print. Off., 1975); *United Nations, Effects of the Possible Use of Nuclear Weapons and the Security and Economic Implications for States of the Acquisition and Further Development of These Weapons* (New York: United Nations, 1968).

24. See, for example, problems encountered in decontaminating Eniwetok Atoll described in U.S. Congress, Senate Committee on Armed Services, *Military Construction Authorization Fiscal Year 1976* (Washington, D.C.: U.S. Govt. Print. Off., 1975), pp. 399-436.

25. Taylor, "Diversion by Non-Governmental Organizations," p. 190.

26. See U.S. Defense Atomic Supply Agency, *Proceedings of the Third Interdisciplinary Conference on Selected Effects of a General War* (Washington, D.C.: Defense Atomic Supply Agency Information and Analysis Center, 1971), especially pp. 92-224.

27. See, for example, Barbara Tuchman, *The Guns of August* (New York: Dell, 1962) for an excellent description of events and perceptions of Europe's leaders leading to the outbreak of World War I.

28. For further discussion, Robert Jervis, "Hypotheses on Misperception," *World Politics*, vol. 20, No. 3, April 1968, pp. 454-479; Irving Janis, *Victims of Groupthink* (Boston: Houghton Mifflin, 1972); and Joseph de Rivera, *The Psychological Dimension of Foreign Policy* (Columbus: Charles E. Merrill, 1968).

29. See for further discussion, Paul C. Szasz, "International Atomic Energy Agency Safeguards," in Mason Willrich, ed., *International Safeguards and the Nuclear Industry*, pp. 73-141; W. Hafele, "NPT Safeguards," and J. Prawitz, "Arguments for Extended NPT Safeguards," in *Nuclear Proliferation Problems*, pp. 142-167.

30. J. Goldblat, "The UN Security Council Resolution of 19 June 1968 and the Security of Non-Nuclear-Weapon States," *ibid.*, pp. 236-241.

31. "Convention for the Suppression of Unlawful Seizure of Aircraft," in U.S. Congress, Senate Committee on Foreign Relations, *Aircraft Hijacking Convention* (Washington, D.C.: U.S. Govt. Print. Off., 1971), pp. 93-96.

32. See, for example, section 2(i) and section 170 of "The Atomic Energy Act of 1954, Public Law 83-703 as amended" in U.S. Congress Joint Committee on Atomic Energy, *Atomic*

*Energy Legislation Through 93rd Congress, 2nd Session* (Washington, D.C.: U.S. Govt. Print. Off., 1975), pp. 5 and 71-80. See also U.S. Congress, House Committee on Interior and Insular Affairs, *Oversight Hearings On Nuclear Energy—The Price-Anderson Nuclear Indemnity Act* (Washington, D.C.: U.S. Govt. Print. Off., 1975).

33. See Isser Harel, *House on Garibaldi Street* (New York: Viking, 1975), for an account of the Israeli Government's kidnapping and forcible extradition of Adolf Eichmann from Argentina to Israel and the subsequent diplomatic furor over the summer of 1960. Hanna Arendt commenting on this aspect of the Eichmann case in her book, *Eichmann in Jerusalem* (New York: Viking, 1963, 1964) observes that Argentina might not have been as willing as it was to forget about the kidnapping of Eichmann had Eichmann been an Argentine citizen. "He had lived there under an assumed name, thereby denying himself the right to government protection, at least as Ricardo Klement (born on 23 May 1913, at Bolzano—in Southern Tyrol—as his Argentine identity card stated), although he had declared himself of 'German nationality.' And he never invoked the dubious right of asylum. . . . All this did not make Eichmann stateless, it did not legally deprive him of his German nationality, but it gave the West German republic a welcome pretext for withholding the customary protection due its citizens abroad." (page 240).

34. United Press International, "7 Nation Nuclear Pact Set," *San Jose Mercury*, 30 January 1976.

35. Dr. Fred C. Ikle, Director of the U.S. Arms Control and Disarmament Agency underscored the value and importance of national intelligence systems in a speech reprinted in the *Hackensack, N.J. Record* entitled "How Will We Know Who Bombed Us?" 14 February 1975.

36. The importance of protecting sources and methods of intelligence was underscored by Arms Control and Disarmament Agency Director Ikle in his advocacy of legislation to make such information privileged. See transcript of *Meet the Press*, vol. 19, No. 31, 3 August 1975, pp. 4-5.

37. "Security Bulletin (RIS:SE-1600-19) ASE-73-3," in U.S. Congress, House Committee on Interstate and Foreign Commerce, *Anti-Hijacking Act of 1973* (Washington, D.C.: U.S. Govt. Print. Off., 1973), p. 306.

38. "Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction," in U.S. Arms Control and Disarmament Agency, *Arms Control and Disarmament Agreements* (Washington, D.C.: U.S. Govt. Print. Off., 1975), pp. 118-124.

39. *Ibid.*, p. 119.

40. *Ibid.*, pp. 119-120.